

## SUMMARY OF CONTENT

There are five papers in this sixteenth issue of Petroleum Technology Development Journal. In the first paper **Optimized Biodiesel Production from Waste Cooking Oil Using Poultry Droppings Catalyst: A Comparison of RSM and ANN**<sup>1</sup> the authors developed a catalyst from poultry droppings for the synthesis of biodiesel from waste cooking oil (WCO). They achieved poultry droppings catalyst characterization by using Brunauer-Emmett and Teller (BET) analysis, fourier transform infrared spectroscopy (FTIR), scanning electron microscope and energy dispersive X-ray (SEM-EDX), X-ray fluorescence (XRF), and X-ray diffraction (XRD). They used Box-Behnken design (BBD) in designing the experiments. They then compared response surface methodology (RSM) and artificial neural network (ANN) to determine their performance in modelling and optimizing the process. The catalysts characterization revealed CaO as the largest constituent and the presence of high surface area (286.322m<sup>2</sup>/g) and pore size (1.853nm). They achieved Optimum biodiesel yield of 90.4694% with a temperature of 43.92°C, reaction time of 120 minutes with a methanol/oil ratio of 6:1 and catalyst loading of 1 wt.%. RSM model was found to be very efficient with R<sup>2</sup> value of 0.9464. The authors conclude that comparing with ANN, ANN performed better with a higher R<sup>2</sup> value of 0.99669.

The second paper is on the **Effect of Catalyst Modification on Biodiesel Production from Waste Vegetable Oil**.<sup>2</sup> The authors observe that the promising catalytic properties of calcium oxide from eggshell makes it desirable as a heterogeneous catalyst for the production of biodiesel from waste oil. The study investigated the effect of modifying plain calcium oxide from chicken eggshells on the transesterification of waste vegetable oil to biodiesel. Using the American Standard Testing Methods (ASTM D6 751-03, 2003), acid value, free fatty acid, density, and viscosity they performed analysis on waste vegetable oil after cleaning. Free fatty acid reduction was done by esterifying the oil with 0.5wt% tetraoxosulphate IV acid in a 1000ml round-bottomed flask. They mounted the round-bottomed flask on a magnetic stirrer having a speed of 650rpm with the reaction temperature set to 60°C. Eggshell as parent catalyst was modified with zinc oxide and titania and the experiment was performed at different catalyst loading. They analyzed the biodiesel produced with different catalysts modification and loadings with Gas Chromatography-Mass Spectrometry. The free fatty acid of the oil which was originally 6.875% was reduced to 2.404%. Also, they obtained a maximum biodiesel yield of 75.52% with plain eggshell at 4wt% catalyst loading. They produced biodiesel of acid value, density, viscosity, flash point, pour point, and cloud point of 1.122mgKOH/g, 878kg/m<sup>3</sup>, 5.82cSt, 118°C, -1.1°C, and 1.7°C respectively.

In the third paper, **Artificial Neural Networks for Modelling Biodiesel Production from Sesame Seed Oil Using Doped Heterogeneous Catalyst Prepared from Periwinkle Shell**,<sup>3</sup> the researchers investigated the synthesis of a bifunctional heterogeneous solid catalyst to produce environmentally benign biodiesel from sesame seed oil. The heterogeneous solid catalyst was synthesized using periwinkle shell as support material while functionalization was carried out using nickel-strontium mixed metal oxides via wet impregnation method. The synthesized catalyst was characterized using X-ray fluorescence (XRF), X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM) and Brunauer, Emmett and Teller (BET) analysis. Artificial Neural Networks (ANN) was used

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<sup>1</sup> Kessington Obahiagbon and David Ohimai Ahonkhai

<sup>2</sup> P. A. Monday and E. T. Akhihero

<sup>3</sup> Ugochukwu Jonathan Anene, Kessington Obahiagbon, and Andrew Nosakhare Amenaghawon

to model the parametric effect of reaction time, reaction temperature, catalyst concentration and methanol to oil ratio biodiesel yield. The results obtained showed that oil yield of 50% was obtained after extraction. The oil had a low kinematic viscosity, acid value, iodine value and peroxide values, making it a suitable feedstock for biodiesel production. Characterization of the solid catalyst revealed that it had high surface area of 367.40 m<sup>2</sup>/g, pore diameter of 2.45 nm and pore volume of 0.198 cm<sup>3</sup>/g. ANN was adequate in modelling the process with high R<sup>2</sup> value (0.9980), adjusted R<sup>2</sup> value (0.9977) and low error values (MSE =0.7547, RMSE =0.868, SEP=1.4091, MAE =0.3348 and AAD =0.5962). Numerical optimization gave a maximum biodiesel yield of 95.61% at corresponding reaction time, reaction temperature, catalyst concentration, and methanol to oil ratio values of 62.55 min, 77.59 °C, 3.20 wt%, and 6.50 respectively. The researchers established that the properties of the biodiesel sample produced at the optimized conditions were comparable with the ASTM D6571 and EN 14214 standards.

The fourth paper examined **Oil Price Shocks and Inflation Dynamics in Nigeria: Symmetry and Asymmetry Approach**.<sup>4</sup> The authors used the linear and nonlinear ARDL technique developed by Pesaran, Shin, and Smith and Shin et al. to examine symmetry and asymmetry in the impact of oil price shocks on inflation dynamics in Nigeria over the period 1970 -2019 using four variables: oil price (Oilp), inflation (INF), money supply (MS) and exchange rate (EXR). The result of the linear relationship indicates that oil prices have a positive and significant effect on inflation in the short run; while in the long run, the effect is insignificant. The nonlinear relationship suggests that rising and falling oil prices have different effects on inflation. The authors assert that while rising oil prices have a positive and significant effect on inflation in all cases, falling oil prices have a negative and significant effect on inflation. The result they say, has passed the residuals and stability diagnostics. The dynamic multipliers, they say, indicate that the positive oil price affects inflation more than the negative oil price and that there is an incomplete pass-through from oil price to inflation in Nigeria during the period of study.

In the fifth paper, **Impact of Structural Dynamics on Hydrocarbon Retention of The Deposits in The Enugu Axis of The Cretaceous Anambra Basin**<sup>5</sup> the author observes that the relationship among the southern Nigeria's inland basins is a direct result of formative tectono-sedimentary interaction within and adjacent to the basins. He also notes that full understanding of the nature of these interactions, especially how they were controlled by the structural dynamics of the basins, remains a challenge. He investigates the mechanisms that directly defined the structural events and sedimentary processes, and the hydrocarbon generation and trapping processes in the Anambra Basin. He used insight from regional cross-sections to highlight a genetic link among the tier-basins from the distal offshore to the onshore, across the Cretaceous – Paleogene (K-Pg) that outcrops in the Enugu Axis. This Axis was defined and illustrated as the geographical region where the axial plane of the Enugu crestal high projects to the surface.

He interpreted a regional seismic line and the results corroborated with those from well data and field studies to show a relatively continuous structural trend, from the oceanic to the continental crust and their overlying formations. This showed that the Enugu Axis of the Anambra Basin is an anchor point, a projection of the paleo-margin serving as a transition from laterally depth-equivalent but diachronous deposits, to highs in the Benue Trough. The

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<sup>4</sup> Ali Baba Usman. Suleiman Sa'ad, Abdulrashid Zubairu

<sup>5</sup> Livinus Nosike

Cenozoic major synthetic faults, and the initiation of displaced blocks in the Niger Delta, are deeply rooted and controlled by the Cretaceous events, including the rifting and magnetic intrusions. These highs and lows affecting the top of the Cretaceous deposits, the author observes, are the drivers that locate and lead to the activation of blocks that slide above the base of the Akata Formation, or equivalent base, of the Cenozoic Niger Delta formations. He also notes that these magmatic events are relatively near surface and exposed beyond the Anambra Basin, in the Benue Trough.

This understanding provides the premise for study of the Cretaceous basins using information from the well-known geology of the associated Niger Delta, where seismic, well and other subsurface data abound. He used such data and methods to analyze the roles of the basins' structural activities in defining the proven petroleum systems and prospects in the area. A similar pattern of deposition in the present-day continental shelf margin explains the clinoform morphology at the subsiding slopes of the late Cretaceous Anambra Basin delta and the pressure transmission that leads to hydrocarbon leaks, gas flares and retained petroleum prospects in the Enugu Axis. A new "plane-wing" concept further explains the anomalies, fold structures and very high dips or upturned units observed in the Benue Trough.

The sixth and final paper is on **Occupational Health, Safety, and Environmental Risk Management in the Oil and Gas Sector: Challenges, Precautions, and Implications.**<sup>6</sup> The author reminds us that in businesses today, there are risks related to Health, Safety, and the Environment (HSE). These risks, she observes, can be harmful to people and the environment, but quickly states that HSE experts help make things safer, especially in the oil and gas industry, where there are safety risks during exploration, drilling and production. Some of the dangers she noted include exposure to dangerous gases and chemicals, noise etc. She suggests that to keep everyone safe, the gas wells should be well managed, careful planning and proper training she emphasised are very important. This research is important because it helps us learn how to manage the risks in the oil and gas industry better. It looks at the problems and solutions to make the workplace safer for workers and the environment. The author emphasises that managing HSE risks in the petroleum industry is crucial for a safe and sustainable energy sector and that by carefully assessing, planning, and training, businesses can reduce risks and prevent accidents.

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<sup>6</sup> Faith Mmesomachukwu Kelechi